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PRESENTATION TYPE: Poster

CURRENT TOPIC: Bioengineering

TITLE: BDNF VAL66MET POLYMORPHISM ATTENUATES EXPLOSIVE JUMP FATIGUE DIFFERENTIALLY AFTER TRANS-SPINAL ANODAL DIRECT CURRENT STIMULATION

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ABSTRACT BODY:

Introduction: Non-invasive anodal trans-spinal direct current stimulation (tsDCS) can modulate central nervous system activity (1-5) with effects lasting for at least one hour post stimulation. In healthy subjects we observed tsDCS to alter the performance of repeated maximal effort explosive countermovement vertical jumps through effects on motor fatigue mechanisms and coordination (6). However, there was significant variability between subjects. Brain-derived neurotrophic factor (BDNF) is a key mediator of activity-based neuroplasticity. Carriers of the BDNF Val66Met single nucleotide polymorphism (Met SNP; rs6265) secrete less BDNF (7) and have altered neuroplastic responses to tsDCS (8) compared to normal Val66Val carriers. Accordingly, we are investigating if any association can be identified between BDNF genotype and changes in repeated jump performance following sham and active anodal tsDCS.

Materials/Methods: Using a double-blind, randomized, crossover, sham-controlled design, healthy participants perform sets of 5 maximal effort jumps prior to, and at intervals after a single application of sham and active tsDCS. Jump performance is assessed from ground reaction force measurements and saliva samples are used for BDNF genotyping.

Results: Of the 14 participants to date, 5 are Met SNP carriers. For up to three hours after sham tsDCS, a fatigue in jump performance was apparent as a reduction in downward countermovement displacement (5%, 1—9%, $P = 0.003$) and final take-off velocity (2%, 0—3%, $P = 0.035$). This natural pattern of fatigue was attenuated differentially in relation to BDNF genotype following active anodal tsDCS. Carriers of the Met SNP increased their jump duration (15%, 5—25%, $P = 0.002$), reduced their push-off acceleration (14%, 2—25%, $P = 0.001$) and increased work done (10%, 2—18%, $P = 0.006$) relative to changes after sham. In contrast, Val66Val carriers increased their downward velocity (11%, 4—19%, $P = 0.002$), braking power (20%, 7—23%, $P = 0.001$), and peak to peak power (5%, 1—9%, $P = 0.017$) compared to sham fatigue effects, but showed no differences in total work done.

Discussion: Our initial results demonstrate long lasting, but differential effect on central fatigue mechanisms following anodal tsDCS based on BDNF genotype. Met SNP carriers maintained jump performance by increasing overall duration and work done relative to sham effects, whereas normal Val66Val carriers maintained jump performance by increasing countermovement braking power and velocity, without changing work done.

Conclusions: Genetic stratification of the functional neuroplastic responses to anodal tsDCS, may have prognostic value or utility in sports training or neurorehabilitation.

Objectives (Please provide three objectives): 1) Upon review of this abstract, delegates will be able to discuss the lasting, functional effects of one 15 minute application of trans-spinal DCS and potential applications in sport or rehabilitation .

2) Based on our initial findings, delegates will be able to discuss the importance of considering individual responses to neuromodulatory treatments based on genetic factors including BDNF gene variants.

3) Delegates will be able to discuss this new data and consider its importance in patient stratification for personalised neuromodulatory treatments.

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KEYWORDS: Fatigue resistance, performance enhancement, genetic variability.

AWARDS:

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Identifying Products, Reporting on Research, and Discussing Unlabeled Uses of Products A: Helen Berry: No to a. | Rothwelle Tate: No to a. | Conor Campbell: No to a. | Bernard Conway: No to a.

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